Optimising the Landing Site Selection Process

Roderik Koenders
Delft University of Technology. Department of Aerospace Engineering
Netherlands
Master of Aerospace Engineering Student at Delft University of Technology
http://www.planetarygis.org

Selecting a landing site on another planetary body is not a trivial task. All the difficulties of getting there aside, most people perceive the start of the mission to be when the probe has safely touched down and is transmitting back science data. Hence, a site needs to be safe enough to land, whereas it has still to promise good scientific returns. Mars is a challenging target destination for a mission with respect to its landing site selection due to two reasons 1) the large amount of data available on Mars, which is good to see small objects and avoid hazards but is difficult to handle in these quantities; and 2) the increasingly specific scientific mission goals and instrumentation, which result in more specific requirements for the landing site. We investigate how a semi-automated support system may be of benefit to the selection of a landing site for ExoMars. Visit http://www.planetaryGIS.org/ for more information.

Selecting a landing site is currently done in three steps 1) the low level data from the PSA and PDS have to be converted and geo-referenced so they can be used in a GIS program; 2) individual sites are analysed in this GIS; and 3) sites are compared based on their 'fitness' with respect to the engineering constraints and the scientific opportunities.

These steps all involve lengthy processes, however, only step 2 and 3 actually add to the results of the analysis. What we found is that step 1 involves a huge investment of time and resources and has to be done in a different way for every data type by every team that wishes to analyse data on Mars. Both step 2 and step 3 are also performed by each team in a different way, using different tools, making the comparison in fitness of two different candidate landing sites more difficult.

When teams work together and share the workload for the low-level tasks this allows them to focus on the higher level, relevant tasks. We propose a community-driven and community-contributed website where users can share tools and data-sets.

Tools can include a) a tool to draw the three-sigma landing ellipse on the terrain and check that this confirms with the engineering constraints; b) a tool to create a standardised report for a landing-site selection workshop; and c) a tool to perform entry and descent verification.

Data that can be shared includes a) footprints of selected instruments with clear instructions on how to proceed and actually load this data into a GIS and analyse it; b) a peri-centre map for

Mars Express, or maps with future orbits of other missions to see if the proposed site can be targeted by certain instruments in the (near) future; and c) vector and/or raster maps as created by the scientific community so any duplicate effort is minimised.

The system is currently being developed to optimize the ExoMars landing-site selection process, but it can be adapted to suit any lander mission, to any planetary body (the Moon, Titan, etc.).